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14. ABSTRACT

Seabasing is envisioned to become a key joint capability for the future. It will provide the Joint Force Commander with great flexibility when dealing with regional crises in locations where traditional land basing will be challenged or denied. When a joint sea base is brought together under the leadership of a Joint Force Maritime Component Commander (JFMCC) it will capitalize on the vast expanses of the sea for the operational functions of movement and maneuver, logistics (to include sustainment), and protection. The natural environment will affect each of these operational functions and play a key role in the JFMCC planning considerations for operations conducted from or through a joint sea base. This paper examines some of the environmental factors that will affect these operations from a historical perspective and through the lens of a simple scenario of a possible future operating environment. The historical perspective will look at Operation Overlord as a case study and the scenario examines the littoral South China Sea. The paper then makes conclusions and recommendations on how the JFMCC can plan for and mitigate the environmental affects on operational functions.

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Joint Seabasing and the Natural Environment
Environmental Impacts on the Operational Functions of Movement and Maneuver, Logistics and Protection When Employing a Joint Sea Base

By

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A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirements of the Department of the Joint Maritime Operations

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

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ABSTRACT

Seabasing is envisioned to become a key joint capability for the future. It will provide the Joint Force Commander with great flexibility when dealing with regional crises in locations where traditional land basing will be challenged or denied. When a joint sea base is brought together under the leadership of a Joint Force Maritime Component Commander (JFMCC) it will capitalize on the vast expanses of the sea for the operational functions of movement and maneuver, logistics (to include sustainment), and protection. The natural environment will affect each of these operational functions and play a key role in the JFMCC planning considerations for operations conducted from or through a joint sea base. This paper examines some of the environmental factors that will affect these operations from a historical perspective and through the lens of a simple scenario of a possible future operating environment. The historical perspective will look at Operation Overlord as a case study and the scenario examines the littoral South China Sea. The paper then makes conclusions and recommendations on how the JFMCC can plan for and mitigate the environmental affects on operational functions.

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I. Introduction

Seabasing*, one of the US Navy's Sea Power 21 pillars, is envisioned to be a key joint capability for the future. It will capitalize on U.S. maritime dominance and exploit the maneuver space of the sea. Joint seabasing expands a Joint Force Commander's ability to rapidly and decisively conduct operations in distributed, non-contiguous, anti-access environments. It will reduce our dependence on fixed and highly vulnerable shore based infrastructure. "Joint Sea Basing (*sic*) will provide … the Joint Force Commander real options to project and sustain synchronized, adaptable Joint Force Capabilities Packages and create the coherent effects necessary for early conflict resolution."[1]

For the purposes of seabasing, jointness means four things: 1) ability of the sea base to serve as a Joint Force Commander's (JFC), location, 2) ability to serve as a dynamic base of operations for all services and Special Operations Forces (SOF), 3) ability to provide logistics for all services and SOF, and 4) ability to support and sustain operations from the sea for all services and SOF[2]. As joint seabasing concepts come to fruition and are employed to support regional combatant commanders, the JFC, and particularly the subordinate Joint Force Maritime Component Commander (JFMCC), will be required to factor in a broader range of environmental concerns in their respective operational plans than traditional maritime operations (e.g. Amphibious and Carrier Strike Operations). This paper will consider three operational functions that will be impacted by the environment and that the JFMCC must plan accordingly for: Movement/Maneuver, Logistics (to include sustainment) and Protection.

To date, much of the literature about Sea Basing suggests that as the world continues to be dangerous, and as other nations seek to deny US freedom of action and forward basing

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* There are many different labeling conventions for the concept of seabasing (Sea Basing, Seabasing, Sea Base, seabase, etc.). For clarity this paper will use the following convention:
seabasing (one word, sentence case), sea base (two words, sentence case)

rights either through political or technological means, land bases will become more vulnerable and unsuitable for conducting military operations. Many authors see that "sea basing provides a powerful alternative to land bases"[3] where political and technological access denial issues are mitigated. They believe "a mobile Sea Base (sic) enhances force protection and reduces the effectiveness of anti-access strategies."[4] Many of the envisioned attributes of a sea base address key operational functions that the JFMCC must deal with in planning operations. Mobility addresses movement and maneuver, an ability to keep logistics and sustainment at sea reduces footprint ashore thereby reducing political concerns when dealing with coalition countries or allies, and mobility and at sea stationing enhances protection and reduces some technological vulnerabilities, allowing US forces to operate wherever and whenever they wish in the great commons of the high seas (sovereignty beyond 12 miles). However, at sea, each of these attribute, operational function pairings will be impacted by a more dynamic and often hazardous natural environment than if the operational functions were to be kept ashore.

When establishing a joint sea base in support of a combatant commander's mission the JFMCC will be required to address environmental issues that not only impact the capabilities of naval assets but rather the capabilities of the entire joint force. For example, if it is decided that logistics for a particular operation will be kept on the sea base while army units conduct operations ashore, the JFMCC must be concerned with the environmental parameters that would affect the ability to provide "just-in-time" support to the units. If the ground units need ammunition re-supply to continue operations there may be meteorological or oceanographic conditions that would prevent immediate transfer of the ammunition from sea to shore. In past amphibious operations this risk was mitigated by building an "iron mountain" ashore, where supplies for several days sustainment were moved ashore during periods that environmental conditions permitted. With seabasing the “iron mountain” ashore may not be available. Under the new way of thinking the JFMCC must be able to anticipate how and when the environment may adversely impact a particular mission, in this case re-supply of the army unit, and plan for ways to “stay ahead” of the environment. The only way that the seabasing concept will ever meet expectations is if those in charge of it, likely a JFMCC, consider and plan for numerous environmental conditions that will impact sea base operations.

One aspect of seabasing that must be addressed is its vulnerability to an adversary’s technological access denial methods. There is a notion that a sea base is relatively less vulnerable than a land base with respect to several methods of attack[5], (e.g. terrorist suicide bombers, ballistic missiles, chemical and biological weapons, etc.). Considering today’s state of the art of these tactics and weapon systems, this notion is on fairly firm footing. However, as seabasing matures and is employed, it is likely that our adversaries will assess the sea base as a critical US vulnerability and will attempt to develop capabilities that will defeat or deny its use. As our adversaries develop and use these capabilities, the littoral natural environment will influence the countermeasures that a JFMCC must employ to defeat them and impact the ability to protect the joint force from an adversary’s attacks.

II. Analysis

A. Historical Context

History is replete with examples of large, complex amphibious operations that came close to meeting the ideas/attributes of the seabasing concept. All fell short in some way, many from the fact that the maneuver phase of operations did not take place until after the amphibious landing, and most from the fact that logistics and sustainment required building of the “iron mountain” ashore. Regardless, in each of the many cases, (e..g. Leyete Gulf, Normandy, and Inchon), there are lessons to be learned; particularly with respect to how the environment played a role in the conduct of movement, logistics and protection.

Normandy is a classic case study to review where seemingly tactical level environmental conditions played a key role in planning at both the strategic and operational levels.[6] At the strategic level, after delays in 1942 and 1943 the allies determined that it was important for operations to begin in Western Europe in spring 1944 to ensure the military survival of the Soviet Union. A confluence of several tactical level environmental conditions was desirable for a successful amphibious landing. Choosing a time when this confluence occurred dictated the operational timing and execution of the Normandy landings.

A dawn landing at low tide would ensure that beach obstacles were most visible and landing craft would avoid prolonged groundings. Fair weather conditions with good visibility, low to moderate winds and little cloud cover were desirable in order to provide effective naval gunfire and air support as well as to provide a reasonable sea state for landing craft. Calm seas would minimize boat accidents, broaching of landing craft and seasickness in the troops that would go ashore. Seasickness during the movement phase would result in fatigued soldiers, reducing their combat effectiveness once landed ashore. Light winds would also help in clearing any fog or smoke from the battlefield. A full moon was preferred to assist with expected nighttime airborne operations. Finally conditions should remain favorable for at least 36 hours to build combat power ashore and bring in supplies, ("build the iron mountain").[7]

In order to schedule a time when the landings could be conducted in the most favorable conditions, tide and lunar predictions became the starting point. They showed only a few days per month when low tides coincided with dawn and near full moon illumination. As far as the dynamic environmental parameters were concerned, (winds, clouds, sea state, visibility, etc.), long range forecasting was not a mature science, but the meteorological staff analyzed climatology to identify times that offered the highest probability for favorable conditions. The data pointed to April or May. [8] "However, a decision to increase the size of the invasion force and the need to conduct additional air operations in preparation for the landing forced postponement until June…" [9] Because of tides, the dates June 4th - 6th were best.

As time came near for the operation to begin, short-term (1-5 day) weather forecasting began to play heavily into the go-no go decision for the operation. A lull in an early June storm on the 6th, (anticipated by Allied, but not German forecasters) permitted Eisenhower to make the go decision, and he was able to gain an operational advantage over the Germans that permitted the movement of the entire amphibious force virtually undetected.[10]

This case study can be used as an analog to the present day concepts of seabasing based on a number of factors. Imagining that the island of England is a surrogate sea base, many similarities can be seen, particularly when examining operational functions. In examining movement and maneuver, moving the massive landing force from over the horizon, across the English Channel, exposed the ships, boats and landing craft to still rough seas causing discomfort to the thousands of troops embarked.[11] With respect to protection, the weather cleared enough that naval gunfire and air support were effective. The function of logistics and sustainment were another matter. While not stopping logistics operations altogether, the weather did slow them down throughout the next two weeks. As the 6th wore on, the winds and seas steadily increased as the second pulse of the storm took hold, and this factor slowed the build-up of combat power ashore as well as re-supply of the force. Since the weather did stay marginal for two days following the landing, enough supplies were slowly moved ashore to ensure that the allies could at least hold their positions.[12] In mid-June a major storm event interrupted and curtailed the landing of supplies for a period of four days and did significant damage to the artificial harbor that had been put in place to serve as a breakwater for the landing area.[13] Since enough combat power and supplies had already been built up by that time, the loss of four days of re-supply did not necessarily impact the pace of operations for the ground forces. Under the present day concepts of seabasing and just in time logistics, given similar conditions, today's warriors may have a different outcome, they may experience an undesirable operational pause.

B. Seabasing in Light of Operational Functions and Environmental Factors

Movement and Maneuver – The joint seabasing concept will build on the Naval Operational Concept of *Forward, From the Sea* and the Marine Corps Operational Concept of *Operational Maneuver From the Sea*. A joint sea base can operate with legal impunity outside of territorial seas. Globally, this affords vast expanses for assembly of the sea base components. In seabasing a joint force will conduct operations from an at sea assembly area. Movement to the assembly area will take place via ocean or air transport. Most heavy equipment will be transported by sea and most personnel will arrive via air and/or high speed, sealift ships. Naval combatant ships will comprise most of the sea based force protection and combat fires capability. Deployment to the sea base will entail moving forces from home or intermediate staging bases to a location where they concentrate and prepare to conduct maneuver and operations against their objective.[14] These forces will generally cross long lines of communication that will be impacted by environmental factors.

For components of the sea base arriving by sea, environmental factors that will affect their movement include direction and speed of ocean currents, sea state, and storm tracks (especially tropical cyclone tracks). Sailing with or against ocean currents can affect the speed at which ocean transports and combatants can travel. Sea state can affect both the speed at which units can travel as well as the comfort of the personnel embarked. If training is required for various missions, high sea state or seas running in a bad direction can adversely affect training or curtail it all together. Naval gunfire, aviation and small boat operations are all impacted by high sea state. Finally, storm tracks along lines of communication either add time required for deployment or increase risk of damage to the force if the storms are not avoided.

For sea base components arriving by air, environmental factors that will affect their movement include, departure weather, winds, turbulence and storm tracks enroute, and finally weather at drop-off (either an intermediate transfer base or the sea base itself). Weather at the point of departure is very important. For example, if Army units deploy from Fort Bragg and Pope Air Force Base in North Carolina in the winter, an ice storm can dramatically slow or even halt the deployment depending on the severity of icing conditions. Other weather parameters that affect deployment, at the departure point include, winds, frequency of thunderstorms and low visibility conditions. Enroute, the deploying force can be affected by upper atmospheric winds. Globally, jet stream winds can exceed 200mph and can either speed up or slow down deployment of airborne assets. As with ships, aircraft must either avoid storm tracks thus increasing time enroute or risk damage caused by storms encountered. At the arrival location, the same type of weather parameters will affect aircraft as at departure. If arriving directly at the sea base, high sea state can prevent landing on the sea base platforms.

Once the Joint Force assembles at the sea base, units will begin operational maneuver against their objectives. The joint force maneuvering from a sea base operating in the littorals will encounter a range of environmental factors. The most complex natural environment that will be encountered is at the air-land-sea boundary of the littorals. The interactions of the three mediums create dynamic terrain, meteorological and oceanographic conditions that are hard to measure and predict. Any number of parameters in this environment can severely impact the maneuver of forces from the sea base to their objective, (see Table 1).

Parameter	Impact on Operational Maneuver
Atmosphere	
Weather	Affects Aviation and Surface Transport
- Clouds	- Slows down due to reduced visibility and turbulence
- Fog	- Slows down due to reduced visibility
- Precipitation	- Slows down due to reduced visibility and ground trafficability
- Wind Speed and Direction	- Affects launch and recovery of air craft and sea state for landing craft or small boats
- Air Temperature	- Affects stamina of personnel, cold and heat extremes require specialized gear and creates fatigue
Ambient Light	- Low light conditions slow pace of operations
Marine Boundary Layer Properties	Affects Aviation and Surface Transport
- Sea Surface and Air Temperature	- Affects Search and Rescue Contingencies and can affect formation of fog reducing visibilities
- Humidity	- Affects stamina of personnel and lift properties of aircraft
- Refractivity	- Affects communications impact Command and Control
Oceanographic	
Tides	- Dictates appropriate landing locations and time
Currents	- Affects the speed of maneuver of small craft and swimmers and can cause Atmospheric Marine Boundary Layer effects
Sea State	
Wave Height and Direction	- Affects speed of maneuver and navigation of small craft and launch and recovery of aircraft
Surf Conditions	- Affects ability for small craft to land ashore and safety of personnel
Turbidity	- Affects navigation of SOF swimmers
Bathymetric/Topographic/Geophysical	
Bottom and Beach Slope	- Affects navigation and trafficability of small craft
Sediment Properties	- Affects trafficability of landing craft
Beach and Bottom Composition	- Affects trafficability
Terrain Type	- Affects ground maneuver speed and navigation
Biologic	
Fishing Activity	- Affects choice of operations areas and navigation of maneuvering units

Table 1. Impact of Littoral Environmental Parameters on Operational Maneuver[15]

Logistics and Sustainment – One of the most recognized capabilities that the joint seabasing concept will bring to the JFC is the ability to keep logistics and sustainment functions at sea. As previously discussed, past amphibious operations relied upon building an "iron mountain" ashore. The "iron mountain" kept the maneuver force sustained and moving. Seabasing is intended to reduce or eliminate the "iron mountain" ashore. In its place will be the ability to flexibly offload from the sea base the right material at the right time to keep the forces ashore sustained. The support concept is called "just in time logistics" and is modeled after evolving civilian logistics processes. The main concern in this function for the JFC, is to avoid operational pauses caused by delay anywhere along the logistics tail.

The environment will play a critical role in this effort. Just as littoral environmental parameters (Table 1.) affect operational maneuver they will also affect the ability to transfer material and personnel ashore. Sea state is of concern when using seaborne transfer modes. Current small craft and lighterage have operating limits of sea state 2-3. Design parameters for near and mid-term logistics components increase the desired operating range to sea state 4.[16] Throughout the world's oceans, sea state is less than 4 most of the time; however, most locations experience varying periods of time when sea state exceeds 4. This is more frequent in the larger oceans and in the mid to high latitudes. In the littoral regions of the world these conditions are generally associated with air mass boundaries (frontal systems), cyclonic storms (tropical and extra-tropical storms) and winds enhanced by terrain effects (funneling down mountainous terrain). These conditions can last from a few hours to several days. During these periods when sea state exceeds state 4, surface logistics transfer and transport will have to be moved or postponed until conditions abate. More logistics will need to be transferred by air, but there are currently size and weight restrictions to doing this, which both slows down the sustainment process and eliminates some heavy material from being transported altogether.

When relying on airborne sustainment of the ground forces from the sea base, the same aviation restrictions apply as in maneuver, with the added concern that temperature and humidity play a crucial role in the amount of lift that current aviation platforms can attain. High temperatures and humidity can significantly reduce the load on aircraft, particularly rotary wing aircraft. Logistics delays caused by the environment will impact the pace of operations and could contribute to mission failure.

Protection – As designed, the sea base will be a JFC critical vulnerability or even an operational Center of Gravity (as suggested by Vego [17]), and therefore adversaries will seek to defeat or damage it. The JFC must provide protection to the joint force throughout the battlespace. Adversaries will use proven technologies and techniques as well as develop new capabilities to deny the sea base freedom of action. Protection of the joint force falls into two categories, 1) protecting the sea base itself, and 2) protecting the forces ashore.

The Defense Science Board identified and discussed several threats that the sea base must defend against, obstacles and mines, sea skimming missiles, submarines, and small boats.[18] Two others that must be considered are ballistic missiles and armed Autonomous Underwater Vehicles (AUV). Actual methods to defend against these threats are beyond the scope and classification of this paper; however, environmental factors will play a crucial role in the defense of the sea base. For airborne threats, the dynamic littoral atmosphere and coastal terrain will affect electromagnetic detection ranges. Refraction, ducting and terrain masking can all significantly impact the ability of the sea base combat systems to detect, track, ID and target airborne threats. In the sea, littoral acoustic conditions and bathymetric features can negatively impact the ability to find obstacles and mines, detect and track submarines, and detect, track and discriminate armed AUV's.

When protecting forces ashore, an extension of the Navy's Sea Shield Pillar of Sea Power 21 will play a role. Sea Shield will, "extend precise and persistent naval defensive capabilities…deep overland to protect joint forces and allies ashore."[19] The key areas of air and missile defense are greatly impacted by the environment. As mentioned earlier, the air-land-sea boundary creates very complex environmental conditions. This is especially true for the atmospheric conditions that affect radar propagation. Because the air mass properties (temperature, humidity, atmospheric pressure and suspended aerosols), change from over water to over land electromagnetic propagation properties change as well and can significantly impact detection ranges and detection probability for air and ballistic missile targets.

C. A Littoral Seabasing Case Study – The South China Sea

While analysis of historical examples such as Operation Overlord are helpful for guidance on operational planning considerations, it is often more helpful to look at potential future scenarios to "see" how a particular concept would be employed. In *The Art of the Long View* Peter Schwartz describes a method for "Planning for the Future in an Uncertain World"[20]. Schwartz implements a scenario based methodology of developing alternate futures that an organization can use for determining the best path that it should take down uncertain roads. The theme of the book is organizational strategic planning, but operational insight can be gained by an organization if it games the scenarios and uses lessons learned to capture how various operational decisions perform in the scenarios. In his book, Schwartz describes a framework assessing an organization's expected operating environment. There are many "operating environments" that a joint sea base will find itself in. Examining how the sea base would perform in a simple scenario can provide insight into how these environments can affect the operational concepts that joint seabasing will employ. This paper will examine effects of the littoral natural environment on seabasing operational concepts.

While by no means certain, the South China Sea (SCS) is a likely area for future conflict. The convergence of trade routes, competing territorial claims, religious and ethnic strife, piracy and competition for natural resources all lead to a very strained strategic environment. Because of U.S. strategic interests in the region, it is plausible that major conflict there would warrant our intervention; either at the request of friends in the region or unilaterally because the stakes are so high. Potential political constraints and adversary access denial strategies make the SCS a plausible location to employ seabasing concepts.

For whatever strategic reasons, assume that a JFMCC with a joint sea base will be established and deployed to the region to do the following three missions: 1) secure the Straits of Malacca and provide security to friendly shipping in the Straits and the SCS, 2) at the invitation of the Vietnamese Government (with the stipulation that only a small number of troops are allowed to remain in country) provide training and conduct counter insurgency operations in their border areas, and 3) at the invitation of the Philippines, provide air and theater missile defense for Philippine territorial and economic claims in the SCS.

The JFMCC determines the following primary threats for each of the three missions. The primary threats to shipping in the Straits and SCS are mines, diesel submarines and armed AUV's. The primary threats to the Vietnamese Government are small unit and terror tactics by the insurgency, distributed in mountainous jungle terrain. The primary threats to the Philippine territorial and economic claims are PRC Guided Missile Boats and Advanced Attack aircraft. When countering these threats, what are some of the environmental concerns that the JFMCC must take into account for movement and maneuver, logistics and protection?

1. Discussion of Climatology/Oceanography for the SCS and Vietnam [21,22] - The climatology for the SCS and Vietnam is tropical to sub-tropical in nature with warm to hot temperatures and generally high humidity. A monsoonal wind regime dominates the region. The Winter Monsoon (Oct – Mar) is characterized by northeasterly winds and is the stronger of the two seasons. The Summer Monsoon (Apr – Sep) is characterized by southwesterly winds and dramatically increased precipitation. In the transition periods between the two seasons the Inter-tropical Convergence Zone moves through the area bringing an increase in thunderstorm activity. The most significant storms in the region are tropical cyclones, and their frequency ranges from zero per year near the equator to five per year near the central portion of the SCS and coasts of Vietnam, China and the Philippines. Most tropical storms occur between July (57% probability) and October (73% probability).

Other than winds associated with tropical cyclones the strongest winds are gale force occurring 10-15% of the time during November in the easternmost SCS at the height of the winter monsoon. Air temperatures range from the low 70°s to mid 90°s throughout most of the basin with some locations along the Vietnam coast exceeding 100°F in the summer.

Because the SCS is a semi-enclosed basin its oceanography is very different from the larger nearby Indian and Pacific Oceans. Depths of 100 fathoms or less extend out from the coastlines through much of the basin, but maximum depth reaches 2000 fathoms in an area between 10°N 112° diagonally to 20°N 120°E. The entire basin has numerous rises, outcroppings that come near the surface and protruding island chains. The generally shallow nature of the basin makes acoustic conditions challenging. High frequency bottom loss can be significant in certain areas. There are large variations in the sound speed structure, due to such factors as depth profile and influx of fresh water due to tropical rains and runoff along the coastlines. The sonic layer depth is generally 50-100ft with shifts throughout the year related to the monsoonal shift and accompanying temperature changes. There are significant areas where the deep sound channel is bottom limited for a surface or near surface source or receiver. Some areas are vulnerable to a convergence zone capability with an appropriate placed source or receiver. The entire basin has significant biologic activity promoting fisheries exploitation and also high degrees of bioluminescence.

South China Sea Climatology Pt 1 – 15°N 115°E Pt 2 – 5°N 110°E				
Month /Location	Mean Wind Speed – kts	% of Obs with Poor Flying Conditions*	Wave Height % of Obs with W/H ≥ 8 ft	% of Obs with Low Cloud Cover ≥ 5/8
JAN Pt. 1 Pt. 2	18 13	8 9	40 25	35 50
APR Pt. 1 Pt. 2	10 6	22 45	5 5	15 15
JUL Pt. 1 Pt. 2	13 9	45 35	20 5	35 28
OCT Pt. 1 Pt. 2	14 8	18 40	35 5	35 40
* Poor Flying Conditions – Low Cloud < 300ft, Visibility < 1 NM, Wind <6 or ≥ 34kts				

Table 2. Some of the Climatic Parameters That Can Affect Sea Base Operations[23]

2. Environmental Impacts on Sea Base Operations - Each assigned mission that the JFMCC will conduct and the associated threat that must be dealt with will be impacted by the climatology (Table 2. addresses some of the climatologic parameters) of the region. Looking at these impacts from the perspective of movement and maneuver, logistics and protection will identify areas of concern where seabasing concepts will be stressed.

Movement and maneuver for each of the mission areas can be most impacted by tropical cyclone activity in the basin. Any threat of a tropical cyclone will limit the mobility of the sea base. It will need to move its components to areas that are considered safe from the potential track of a storm. Tropical storms can last for several days and may keep the sea base out of its preferred position for the duration of the storm and some period of time both before and after a storm moves through. Movement and maneuver can also be hindered by the SCS bathymetry, especially submarines, particularly in the vicinity of the numerous islands.

Logistics, particularly to a force deployed to Vietnam, will be challenged at various times by the frequency of thunderstorms and poor flying conditions due to low visibility from fog and rain. Sea borne logistics is less troublesome. but will have to take into account the navigational hazards of shallow water and very dense fishing traffic. Some of the proposed sea based logistic technologies will have trouble meeting desired just-in time throughput due to some periods of seas greater than eight feet (sea Table 2). Eight-foot seas are on the upper limit of sea state 4, the proposed working limits for many sea based logistics technologies. The impact will be to either miss delivery of materials when needed, require additional material delivered prior to an expected high seas event, or require air delivery of more material. As mentioned previously, the last option may not be feasible due to the size or weight of the required material.

The environment will significantly impact protection of the joint force in each of the missions. Shallow depths will limit the locations that submarines can operate. Poor acoustic conditions (caused by shallow depths, high shipping density, poor sound speed profiles and biologic activity), will adversely affect mine and anti-submarine warfare, as well as the ability to detect, track and identify armed AUVs. For airborne threats, detection ranges and the ability to track aircraft and missiles will be adversely affected by rain, thunderstorms and refractive conditions that change between the air-sea-land interface along the coastlines and over the many islands. If called upon to provide close air support to forces operating in Vietnam, weapons systems will be impacted by rain, fog, clouds and rough terrain. Previous experience in Vietnam indicates how challenging the environment can be. Admiral Moorer, former CJCS, commenting before congress in 1973 about the North Vietnamese invasion prefaced his testimony with a weather synopsis and commented, “Weather programs play a greater part with respect to the military activities in South Vietnam than in any part of the world".[24] The most significant impact came from low ceilings, fog and poor visibilities. These parameters hindered Air Cavalry maneuver and the employment of smart bombs (evolving laser and TV guided weapons).[25]

III. Conclusions

The joint sea base is one tool of many that the JFC can bring to bare against an operational problem, be it war or MOOTW. In certain scenarios, such as the SCS, there may be advantages for the joint force to operate from a sea base. A JFMCC will not experience adverse environmental conditions throughout the duration of an operation, but there are transient periods when environmental conditions can slow the pace of movement and maneuver, prevent the delivery of logistics and increase risk due to the inability to adequately protect the force. A JFMCC operating in the SCS or anywhere must be ready to flex and adapt to meet challenging environmental conditions in order to ensure mission success.

Before choosing the seabasing option a JFC must understand the environment well enough to ensure that the operational risk at sea is less than a shore based alternative. If the risk is acceptable and a sea base is established the JFMCC then becomes the one most concerned with the operational impacts of the natural environment. One of the mechanisms to assist the JFC and the JFMCC to make the right operational decisions based on environmental impacts is to study a region's climatology, as in the case of Operation Overlord.

Past experience and efforts taken in conducting research for this paper indicate that climatology studies for operational planning are done on a case-by-case basis, using data records compiled and analyzed many years ago and in the case of maritime operations, are conducted with a focus on blue-water naval operations. Many of the Navy climatology studies for the oceans were published during the height of the Cold War and are therefore biased towards the expected operations of that period. Over the past twenty years vast quantities of new data have been collected by new technologies and methods. While this data is archived and available for climatology studies, very few definitive operational climatologies have been published directed at the expected operating environment of the sea base, that is the very dynamic littoral regions of the globe.

The recommendations below are a starting point to ensure that JFC’s and JFMCC’s have the right environmental knowledge to make sound operational decisions. The goal is for the JFMCC to use that knowledge to mitigate adverse environmental conditions when employing a sea base.

IV. Recommendations

As the seabasing concept matures and initial experimentation takes place, JFC’s and JFMCC’s must use lessons learned to levy valid programmatic requirements that will minimize environmental impacts on sea base operations. Some of these requirements should lead to enhanced or additional material solutions while others will lead to non-material ones. One such non-material solution that could be addressed now is the development of new global operational climatologies. To meet this need, Combatant Commanders should levy and prioritize requirements for publication of comprehensive climatology studies tailored to sea base operations for their respective regions.

When planning for movement and maneuver of the sea base, the JFMCC must have a global perspective of the environment to understand the impacts that transient environmental conditions can have on the deployment of forces, particularly linking up troops to material at sea. In order to best manage the phasing and synchronization of operations, the JFMCC will be concerned with aviation weather at home bases in CONUS as well as the local and regional weather and oceanography where operations are taking place.

For logistics the JFMCC must ensure that an operations sustainment plan is flexible enough to buffer against environmental conditions that can slow or stop re-supply of forces ashore. While the desired endstate is to have no "iron mountain" ashore, the JFMCC must prevent operational pauses caused by weather delays. This may require being able to flex the logistics tail to surge forward anticipated supplies if an adverse environmental event is predicted. Operational risk management will come into play in determining the quantity of supplies to put forward versus the confidence in a predicted environmental scenario. A key factor to consider is the various operational limits of the logistics systems. The JFMCC must know which systems can be used under what conditions and know when the conditions will make it unsafe to operate.

In developing a protection plan for the sea base and the forces that will use the sea base, the JFMCC must understand the environmental impacts on defensive and offensive weapons systems to ensure that the protection is effective. The JFMCC must be aware of weapon systems capabilities and limitations and be able to quickly evaluate risk to make the best decisions for protecting the force. When given the opportunity he should be able to exploit environmental conditions to act or react against an adversary by being able to choose the right weapon system for the conditions at hand. All of this requires understanding a great range of conditions and impacts from the seabed to outer space, from areas over water to well inland.

For each of the operational functions examined, bringing all of the required environmental knowledge together for the JFMCC to make sound decisions will require solid operational planning. Plans for movement and maneuver, logistics, and protection must be able to meet the challenges of the anticipated operating environment and have enough flexibility to accommodate any unforeseen environmental occurrences. One way to facilitate planning would be to capitalize on ongoing changes within the Naval METOC organization relating to the shift of emphasis to littoral operations and the exploitation of Network Centric operations.[26] In order to meet all the needs of the joint warfighter in the littoral operating environment an extension of these changes will require partnership with the Air Force meteorology program. A robust joint METOC cell, either afloat or in a reach-back mode, dedicated to the JFMCC for seabasing operations, and fused with all levels of planners, will ensure that environmental impacts will have minimal adverse effect on the entire joint force when called into action from a sea base.

Endnotes

[1] Lloyd Abbott, Joint Sea Basing (Seabasing Community of Interest Conference, NSWC Carderock, MD: 17-18 March 2004) PowerPoint Slide#17.

[2] Department of Defense, Defense Science Board Task Force on Sea Basing (Washington, DC: August 2003), 9.

[3] Ibid., 28.

[4] Ibid., 28.

[5] Ibid., 28.

[6] James Martin Stagg, Forecast for Overlord, June 6, 1944 (New York: W.W. Norton & Company Inc. 1971), 11-19.

[7] Harold A. Winters and others, Battling the Elements, Weather and Terrain and the Conduct of War (Baltimore and London; The Johns Hopkins University Press 1998), 23.

[8] Ibid., 23-25.

[9] Ibid., 25.

[10] Ibid., 31.

[11] Ibid., 28.

[12] Ibid., 28-29.

[13] Ibid., 29.

[14] Milan N. Vego, Operational Warfare (Newport, RI: US Naval War College 2000) 289.

[15] National Research Council of the National Academies, Ocean Studies Board, Environmental Information for Naval Warfare (Washington, DC: The National Academies Press 2003) adapted from list on 23.

[16] Defense Science Board, August 2003, 59.

[17] Vego, 309 and 311

[18] Defense Science Board, August 2003, 53.

[19] Department of the Navy, Naval Transformation Roadmap 2003 (Washington, DC: 2003) 19.

[20] Peter Schwartz, The Art of the Long View, Paperback Edition (New York: Currency Doubleday1996) Cover.

[21] Department of the Navy, Naval Oceanographic Command Detachment Asheville, NC, U.S. Navy Regional Climatic Study of the Central East Asian Coast and Surrounding Waters (Asheville, NC November 1989) Multiple pages.

[22] Department of the Navy, Naval Oceanographic Office Environmental Guide for the Indian Ocean Area IN 2 (Bay Saint Louis NSTL MS: August 1983) Multiple pages.

[23] Department of the Navy, November 1989, adapted from multiple pages.

[24] John M. Fuller, Weather and War (Scott Air Force Base, IL: US Air Force Air Weather Service 1974) 15.

[25] Fuller, 14-15.

[26] Department of the Navy, Naval Meteorology and Oceanography Command, Draft CONOPS for Naval Oceanography, 2005 (Bay Saint Louis, MS: 2005) Multiple pages.

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